NATIONAL SURVEY OF SEA LICE (*LEPEOPHTHEIRUS SALMONIS* KRØYER AND *CALIGUS ELONGATUS* NORDMANN) ON FISH FARMS IN IRELAND – 2004

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INTRODUCTION

Sea lice are regarded as having the most commercially damaging effect on cultured salmon in the world with major economic losses to the fish farming community resulting per annum (Bristow and Berland, 1991; Jackson and Costello, 1991). They affect salmon in a variety of ways; by reducing fish growth; by causing loss of scales, which leaves the fish open to secondary infections (Wootten *et al.*, 1982); and by damaging the fish, which reduces its marketability. The two species of sea lice found on cultured salmonids in Ireland are *Caligus elongatus* Nordmann, a species of parasite that infests over 80 different types of marine fish, and *Lepeophtheirus salmonis* Krøyer, which infests only salmon and other salmonids.

L. salmonis is regarded as the more serious parasite of the two species and has been found to occur most frequently on farmed salmon (Jackson and Minchin, 1992). Most of the damage caused by these parasites is thought to be mechanical, carried out during the course of attachment and feeding (Kabata, 1974; Brandal *et al*., 1976; Jones *et al*., 1990). Inflammation and hyperplasia (enlargement caused by an abnormal increase in the number of cells in an organ or tissue) have been recorded in Atlantic salmon in response to infections with *L. salmonis* (Jones *et al*., 1990; Jonsdottir *et al*., 1992; Nolan *et al*., 2000). Increases in stress hormones caused by sea lice infestations are thought to increase the susceptibility of fish to infectious diseases (MacKinnon, 1998). Severe erosion around the head caused by heavy infestations of *L. salmonis* has been recorded previously (Pike, 1989; Berland, 1993). This is thought to occur because of the rich supply of mucus secreted by mucous cell-lined ducts in that region (Nolan *et al*., 1999). In experimental and field investigations carried out in Norway heavy infestation was found to cause fish mortalities (Finstad *et al*., 2000). Examples of ovigerous female *L. salmonis* and male *L. salmonis* are shown in Figure 1. The mean length for an adult female is 8mm-11mm and a male is 5mm-6mm (Schram, 1993).

Caligus elongatus is not as host specific as *L. salmonis* and parasitises a wide range of marine fish (Kabata, 1979). This, combined with the migrating patterns of their hosts, is thought to account for the highly variable levels on farmed salmonids at different times of the year. An example of an ovigerous Female *C. elongatus* and a male *C. elongatus* are shown in Figure 2. *C. elongatus* averages about 6-8mm in length (Hogans & Trudeau, 1989).

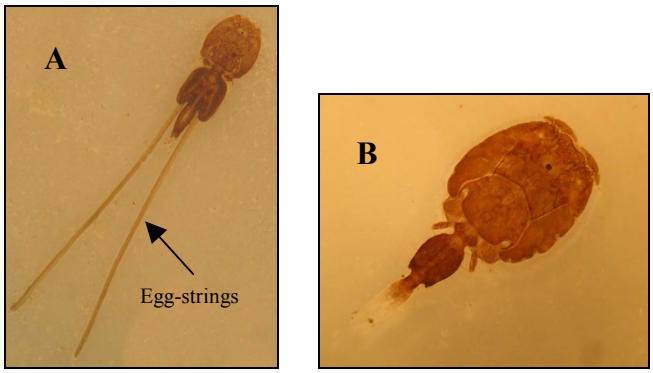

Figure 1. A- Ovigerous adult female *L. salmonis*. B-Adult male *L. salmonis*.

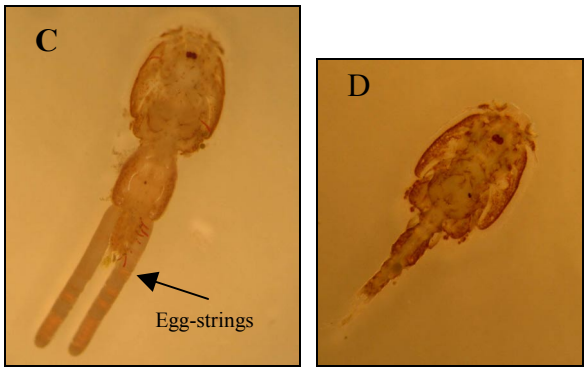

Figure 2. C- Ovigerous adult female *C. elongates*. D- Male *C. elongates.*

In 1991, the then Department of the Marine instigated a sea lice monitoring programme for finfish farms in Ireland. In 1993 it became a nationwide programme. In May 2000 the protocol for sea lice monitoring was formally published (Monitoring Protocol No.3 for Offshore Finfish Farms – Sea Lice Monitoring and Control).

The purpose of the National Sea Lice Monitoring Plan is:

- To provide an objective measurement of infestation levels on farms.
- To investigate the nature of the infestations.
- To provide management information to drive the implementation of the control and management strategy.
- To facilitate further development and refinement of this strategy.

The sea lice control and management strategy has five principal components:

- Separation of generations.
- Annual fallowing of sites.
- Early harvest of two-sea-winter fish.
- Targeted treatment regimes, including synchronous treatments.
- Agreed husbandry practices.

Together, these components work to reduce the development of infestations and to ensure the most effective treatment of developing infestations. They minimise lice levels whilst controlling reliance on, and reducing the use of, veterinary medicines. The separation of generations and annual fallowing prevent the vertical transmission of infestations from one generation to the next, thus retarding the development of infestations. The early harvest of two-sea-winter fish removes a potential reservoir of lice infestation and the agreed practices and targeted treatments enhance the efficacy of treatment regimes. One important aspect of targeted treatments is the carrying out of autumn / winter treatments to reduce lice burdens to as close to zero as practicable on all fish, which are to be over-wintered. This is fundamental to achieving zero / near zero egg bearing lice in spring. The agreed husbandry practises cover a range of related fish health, quality and environmental issues in addition to those specifically related to lice control.

The setting of appropriate treatment trigger levels is an integral part of implementing a targeted treatment regime. Over the period since the initiation of Single Bay Management (SBM), treatment triggers have been progressively reduced from a starting point of 2.0 ovigerous female lice per fish during the spring period to the current treatment levels of 0.3 – 0.5 ovigerous female lice per fish. Where numbers of mobile lice are high, treatments are triggered even in the absence of egg bearing females. Outside of the critical spring period, a level of 2.0 ovigerous female lice per fish acts as a trigger for treatments.

Treatments are administered to farmed fish either as in-feed treatments or as topical / bath treatments. Currently, there are three licensed sea lice treatments in Ireland. Two of these, CALICIDE® and SLICE®, are in-feed and the third, EXCIS®, is a topical treatment. CALICIDE® contains teflubenzuron which acts as a chiton synthesis inhibitor that interferes with the cuticle formation of the louse. It is effective against the moulting stages of the life cycle and it has a 7 day withdrawal period. SLICE® contains emamectin benzoate, which interferes with the peripheral nervous system of the louse causing paralysis or death. It is effective against all stage of the life cycle and has no withdrawal period. The topical treatment EXCIS® contains cypermethrin, which also affects the nervous system of the louse. It is effective against all stages of the life cycle and has a 24 hour withdrawal period.

METHODOLOGY

All stocks of salmonids on all farms in Ireland are visited on 14 occasions throughout the year and sea lice numbers are recorded. Follow-up inspections may be carried out where required. One lice inspection takes place each month at each site where fish are present, with two inspections taking place each month during March, April and May. Only one inspection is carried out for the December-January period. At each inspection two samples are taken for each generation of fish on site, a sample from a standard cage (which is sampled at each inspection) and a sample from a random cage (which is selected on the day of the inspection). Thirty fish are examined for each sample. These are anaesthetised in a bin, which at the end of the sample is sieved for any detached lice. Each fish is examined individually for all mobile lice. Lice are removed using forceps and placed in 30ml screw top plastic bottles containing 70% alcohol, one bottle per fish. The results presented in this report (Appendix 1) refer to mean lice numbers per fish. The mean was obtained by adding the number of lice taken per fish with the number from the bin, and dividing by the number of fish examined.

In the year 2004 salmonid farms stocked 5 different stocks of fish. These were; 2003 rainbow trout; 2004 rainbow trout; 2002 Atlantic salmon (two-sea-winter salmon); 2003 Atlantic salmon (one-sea-winter salmon) and 2004 Atlantic salmon (smolts). S½ fish are transferred to sea in Autumn / Winter of the same year that they are hatched. Their S1 siblings smoltify and are put to sea in early spring, some three to four months later. Grower salmon or one-sea-winter, salmon which are at sea for a year or longer in April, are treated separately from younger salmon (smolts) and rainbow trout. All generations of farmed fish were examined during the year 2004.

There are three distinct regions in Ireland where salmon farming is carried out, the West (Counties Mayo and Galway), the Northwest (Co. Donegal) and the Southwest (Counties Cork and Kerry). These regions are geographically separate from each other with distances between regions of *c.*160 km from Northwest to West and *c.*200 km from West to Southwest. In the year 2004 a total number of 38 sites were inspected around Ireland. See Figures 3-6.

Results presented are mean ovigerous sea lice levels (egg bearing adult female lice) and mean mobile sea lice levels (all lice that have developed beyond the attached chalimus

stages) for *Lepeophtheirus salmonis* and *Caligus elongatus*. Total mobile levels estimate successful infection levels, with ovigerous lice levels estimating successful breeding female populations. The regularity of the monitoring protocol outlined above aims to evaluate the levels of lice on growing fish and to bring them under control, if necessary, by advising treatment. Effective parasite control is characterised by a drop in lice levels on the subsequent inspection.

Sea lice levels on smolts going to sea

Routine monitoring is not normally carried out on smolts until they are in seawater for three months, due to the fact that lice numbers are not normally significant during the first few months the fish are at sea. However the smolts inputted in autumn 2003 and spring 2004 showed signs of early infestation of sea lice in some locations and this lead the Marine Institute to undertake additional non-routine sampling of smolts going to sea. This investigation was carried out to establish the infestation pressure on smolts immediately after they go to sea. The counts were taken monthly for the newly inputted smolts usually beginning one month after the fish were put to sea. Generally 15 fish were sampled and the mean lice level per fish was established. This data is presented graphically in Figure 10.

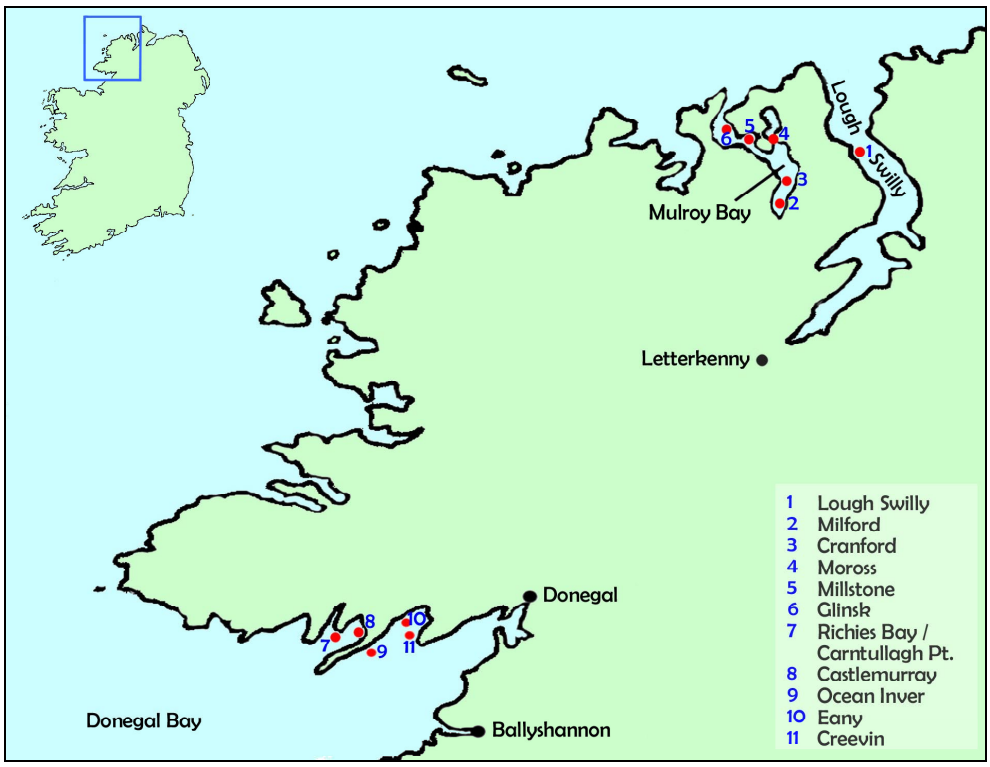

Figure 3. Location of fish farms in Northwest region.

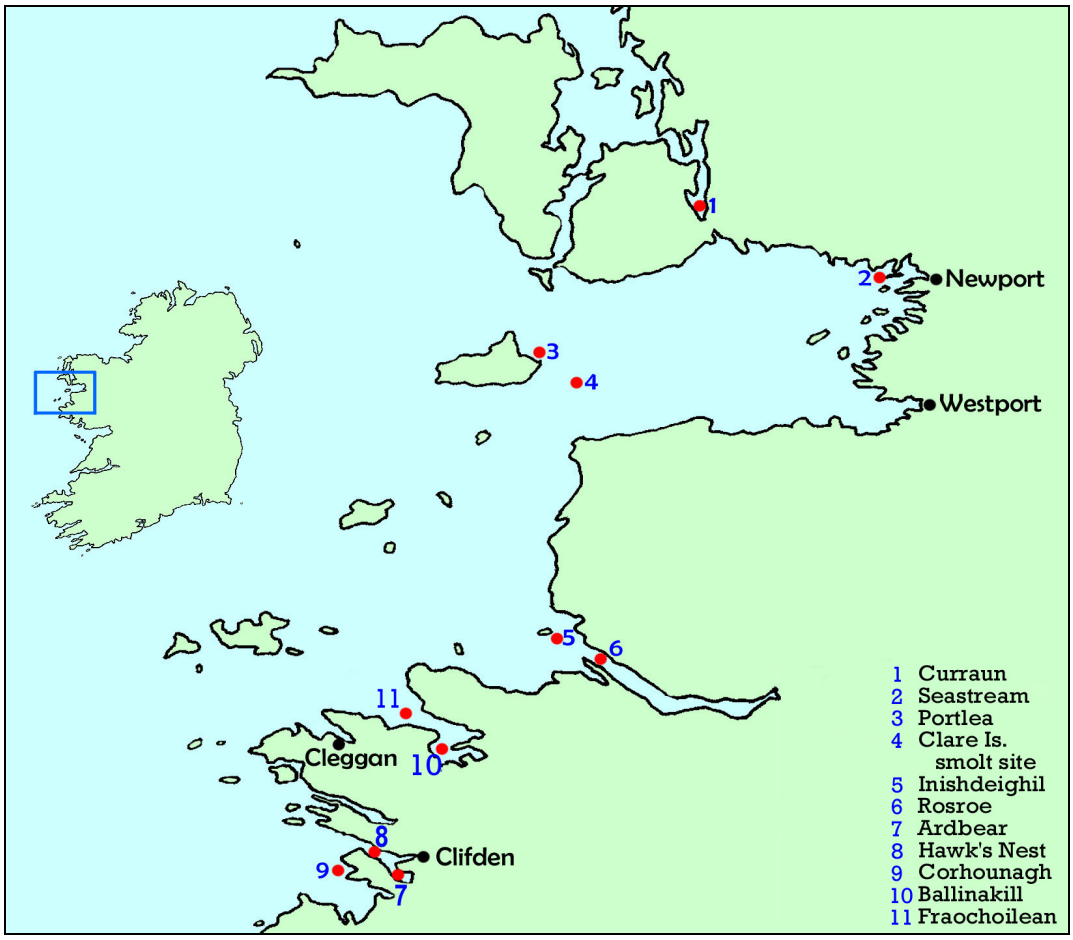

Figure 4. Location of fish farms in the Western region (Clew Bay / Connemara).

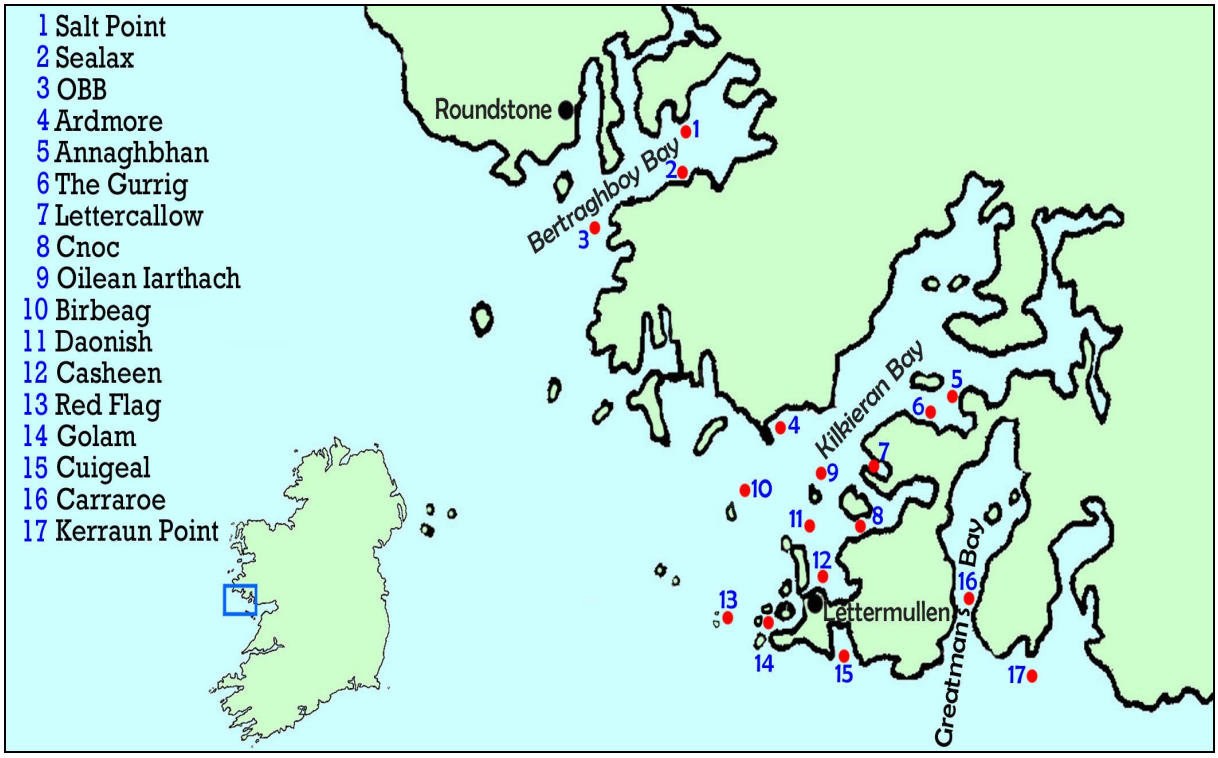

Figure 5. Location of fish farms in the Western region (Connemara).

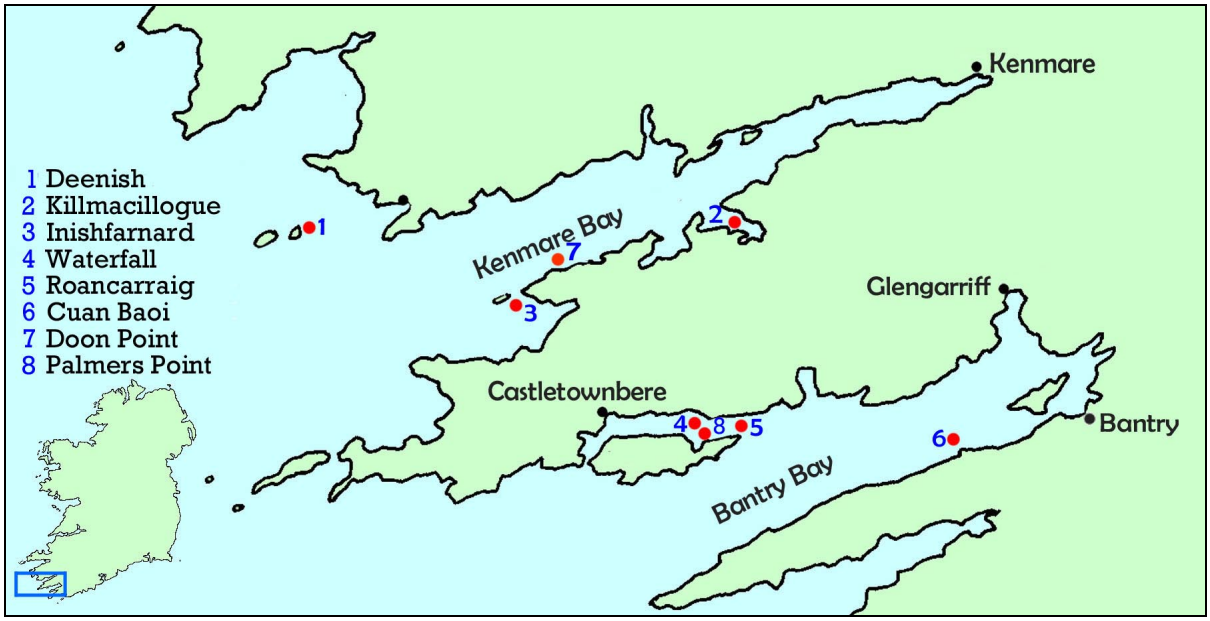

Figure 6. Location of fish farms in the Southwest region.

RESULTS

Atlantic salmon 2004 (Smolts)

A total of 133 visits were undertaken at 23 sites stocking S1 and S½ smolts during the year 2004. *Lepeophtheirus salmonis* levels were maintained below the treatment trigger level of 0.5 ovigerous female lice per fish throughout the critical spring period. Outside of this period levels exceeded 2.0 ovigerous female lice per fish on 7 occasions.

Caligus elongatus levels remained low throughout the year on 2004 smolts.

Atlantic salmon 2003 (one-sea-winter salmon)

One-sea-winter salmon were stocked in a total of 21 sites in 11 bays in 2004. One hundred and eighty three visits were undertaken to this generation of fish. A total of six sites in six different bays continued to stock one-sea-winter salmon in November 2003.

Ovigerous *L. salmonis* levels greater than the treatment trigger levels were recorded in a total of 61 inspections (33%) on one-sea-winter fish. Within the critical spring period, lice levels were in excess of 0.5 ovigerous females per fish on 41 occasions (44%) and outside of the spring period 20 inspections (22%) were in excess of 2.0 ovigerous female lice per fish.

In the Southwest region, levels greater than the treatment trigger levels were recorded on 6 of the 47 inspections (13%). Cuan Baoí (Cuan Baoí Seafarms Ltd.), Bantry Bay, had values above treatment trigger levels on three inspections; one in April, one in May and again in November.

In the Western region, levels greater than the treatment trigger levels were recorded on 26 out of 36 inspections (72%) in the spring period (March – May) and 9 out of 35 inspections (26%) outside the spring preiod. Levels at Carraroe (Tairgeoiri Biamara Atlantach Teo.), Greatman's Bay, were in excess of treatment trigger levels on all visits in the spring period and again in July and August prior to harvesting out. Lice levels at Daonish (Muirachmhainni Teo.), Kilkieran Bay, exceeded the treatment trigger levels on four out of five occasions in the spring period before harvesting out. At Salt point (Comhlacht Bradain Connamarra Teo.) levels were in excess of treatment trigger levels for all six visits in the spring period and again in July prior to harvesting out. At Hawk's Nest (Mannin Bay Salmon Co. Ltd.) levels were in excess of treatment trigger levels on three occasions during the spring. Lice levels were in excess of treatment trigger levels at Rosroe (Celtic Atlantic salmon (Killary) Ltd.) for the February inspection and on both inspections in March. Also on one inspection each in April and May before being controlled.

Lice levels at Portlea (Clare Island Seafarms Ltd.), Clew Bay, were in excess of treatment trigger levels for the first visit in March and again in September and October. Following the transfer of these fish to Seastream Inner, treatment trigger levels were exceeded again during the November visit.

The treatment trigger levels were exceeded on 11 out of 34 inspections (32%) in the Northwest region during the critical spring period and on 9 out of 31 inspections (29%) outside that period. Cranford A (Marine Harvest), Mulroy Bay, had lice levels in excess of treatment trigger levels in December, again in March and for one inspection in April but subsequently achieving control. Moross (Marine Harvest), Mulroy Bay, was in excess of

levels in December and for the first 3 spring visits but then achieved control. Millstone (Marine Harvest), Mulroy Bay, had elevated lice levels for the first inspection in March and again in September, October and November. Lough Swilly (Marine Harvest) 2003 fish had lice levels above the treatment trigger levels in December, February, for both inspections in March and then again in October and November.

C. elongatus levels were consistently recorded at a low level throughout the year, with the exceptions being Deenish (Silver King Seafood Ltd.), Kenmare Bay, in July where relatively high numbers of *C. elongatus* were recorded.

Atlantic salmon 2002 (two-sea-winter salmon)

At the beginning of 2004, two-sea-winter salmon were still being stocked on four sites, Cuan Baoi (Cuan Baoi Seafarms Ltd.), Lough Swilly (Marine Harvest), Seastream outer and Seastream inner (Clare Island Seafarm Ltd., Clew Bay). A total of 12 visits were undertaken to these sites before harvesting was completed, with 50% of inspections exceeding treatment trigger levels. *L. salmonis* levels on these fish were above the treatment trigger at all these sites inspected during the December/January inspections. Cuan Baoi was not inspected during the December/January period as the fish were on starve for harvesting but were subsequently inspected in February, due to delayed harvesting, where they were in excess of treatment trigger levels. These fish were then harvested out. Lough Swilly lice levels were in excess of treatment levels in December/January and February before being harvested out. Seastream Inner lice levels exceeded treatment trigger levels on the first inspection in March but were subsequently controlled. These fish were harvested out in June.

Rainbow trout

In 2004 there were two stocks of rainbow trout present. The 2003 stock were in Seastream Inner and were harvested prior to the February visit. A total of 21 visits were undertaken to 2004 rainbow trout stock. Levels remained below the treatment trigger levels except on one inspection in the spring period.

Sampling record

In 2004 one site visit was missed due to adverse weather conditions and three visits due to fish health issues.

All the mean values for each farm visit can be seen in Appendix 1.

Sea lice levels on smolts going to sea

From Figure 11, which shows the non-routine lice counts, it can be seen that lice numbers remained low on most sites following introduction to sea, Inishdeighil being the exception where the numbers rose rapidly. The two Kilkieran bay sites, Lettercallow and Golam, also showed rapid infestation of newly inputted smolts.

Monthly Trends: *Lepeophtheirus salmonis* and *Caligus elongatus*

Mean ovigerous and mean mobile *L. salmonis* and *C. elongatus* levels for each bay are shown in Table 1 for one-sea-winter salmon throughout the year. Mean monthly ovigerous *L. salmonis* levels were greater than the treatment trigger level of 0.5 ovigerous lice per fish on 17 occasions during the critical spring period, for mean bay data. These occurred in Bantry Bay(1), Kenmare Bay(1), Greatman's Bay(3), Kilkieran Bay(2), Bertraghboy Bay(3), Mannin Bay(1), Killary Harbour(1), Clew Bay(2), Donegal Bay(1), Mulroy Bay(1) and Lough Swilly(1). On 18 occasions, outside of the critical spring period, mean ovigerous levels of at least 2.0 per fish were recorded. These occurred in Bantry Bay(1), Kenmare Bay(1), Greatman's Bay(2), Bertraghboy Bay(1), Mannin Bay(2), Killary Harbour(1), Clew Bay(3), Mulroy Bay(3) and Lough Swilly(4).

Mean Mobile levels in excess of 10 mobile *L. salmonis* per fish were recorded on 19 occasions and 7 of these showed means of greater than 20 mobile lice per fish.

Regional Monthly Means

L. salmonis monthly mean figures for one-sea-winter salmon are shown in Figures 7 and 8 for each of the three regions where lice inspections were carried out. Regional monthly mean *L. salmonis* levels in the Southwest were above the treatment trigger levels only once in April. In the Western region monthly mean ovigerous levels were in excess of treatment trigger levels throughout the spring period, in March, April and May, and also for the whole period July to November inclusive. In the Northwest region monthly mean ovigerous levels exceeded the treatment trigger levels in March and again in September, October and November.

Annual trends

L. salmonis ovigerous and mobile lice level trends are compared in Figures 9 and 10 for one-sea-winter salmon in the month of May from 1991 to 2004. The mean number of ovigerous lice per fish, and the mean number of mobile lice per fish are presented. From 1998 to 2001 the levels decreased steadily for both ovigerous and total mobile lice. Mean ovigerous *L. salmonis* levels increased in 2002, remained steady in 2003 and show a slight decrease again in 2004. Mean mobile levels increased from 2001 to 2002 and again to from 2002 to 2003 but show a reduction in the 2004 figure.

Table 1. Mean ovigerous and mean mobile *Lepeophtheirus salmonis* and *Caligus elongatus* per month, for one sea-winter salmon for each bay inspected in the year 2004.

Mean ovigerous *Lepeophtheirus salmonis*

	Lough Swilly	Mulroy Bay	Donegal Bay	Clew Bay	Killary Harbour	Mannin Bay	Bertraghboy Bay	Kilkieran Bay	Greatman's Bay	Kenmare Bay	Bantry Bay
Dec / Jan	2.83	1.42	0.41	1.83	0.33	0.25	0.59	0.49	0.67	0.03	0.16
Feb	3.65	1.00	0.96	0.15	2.92	0.65	0.41	1.07	0.65	0.08	0.44
Mar	2.81	1.10	1.02	0.57	2.54	0.40	1.55	1.30	0.58	0.18	0.31
Apr	0.39	0.38	0.24	0.30	0.48	2.82	2.07	0.46	0.92	0.46	0.66
May	0.09	0.16	0.14	0.55	0.40	0.14	2.44	1.50	1.08	0.15	0.44
Jun	0.02	0.18	0.36	0.74	0.31	5.85	1.71	HO	1.33	0.04	0.60
Jul	0.04	0.35	0.74	0.71	0.14	1.69	3.87		8.36	0.13	0.62
Aug	0.26	0.32	HO	1.37	1.22	1.91	HO		6.11	0.27	1.35
Sep	0.64	4.19		5.78	HO	1.55			HO	2.12	1.30
Oct	3.37	11.47		4.34		10.25				0.21	1.87
Nov	5.68	13.45		5.70		1.30				0.50	2.40

Mean mobile *Lepeophtheirus salmonis*

	Lough Swilly	Mulroy Bay	Donegal Bay	Clew Bay	Killary Harbour	Mannin Bay	Bertraghboy Bay	Kilkieran Bay	Greatman's Bay	Kenmare Bay	Bantry Bay
Dec / Jan	22.61	11.63	3.11	8.26	8.33	1.36	2.09	2.12	2.29	0.41	1.56
Feb	8.57	2.79	4.22	0.85	21.86	2.02	3.21	4.42	1.94	0.62	2.53
Mar	5.41	2.06	2.89	1.47	9.69	3.24	10.87	7.97	2.52	1.27	1.64
Apr	0.63	0.58	0.68	1.16	1.33	14.56	9.42	2.68	2.51	1.55	5.79
May	0.12	0.24	0.69	2.18	0.57	6.16	7.47	7.87	2.69	0.27	2.27
Jun	0.03	0.86	1.00	2.12	0.50	14.77	8.55	HO	13.98	0.48	1.50
Jul	0.27	1.21	1.73	2.68	1.63	15.16	5.87		13.92	1.36	4.96
Aug	0.74	2.88	HO	3.83	5.13	4.61	HO		11.61	0.48	2.52
Sep	5.27	28.03		10.92	HO	2.57			HO	6.08	5.10
Oct	10.37	28.22		17.34		25.87				1.16	3.60
Nov	12.94	29.24		23.03		3.23				1.13	4.40

Mean ovigerous *Caligus elongatus*

	Lough Swilly	Mulroy Bay	Donegal Bay	Clew Bay	Killary Harbour	Mannin Bay	Bertraghboy Bay	Kilkieran Bay	Greatman's Bay	Kenmare Bay	Bantry Bay
Dec / Jan	0.05	0.00	0.38	1.98	0.47	0.03	0.06	0.00	0.09	0.66	0.63
Feb	0.00	0.00	0.40	0.11	2.07	0.00	0.04	0.01	0.04	0.25	0.83
Mar	0.01	0.00	0.11	0.22	0.01	0.02	0.17	0.02	0.01	0.20	0.86
Apr	0.00	0.00	0.02	0.03	0.00	0.09	0.05	0.04	0.01	0.18	2.21
May	0.00	0.00	0.04	0.35	0.00	0.00	0.01	0.02	0.04	0.18	0.52
Jun	0.00	0.00	0.36	1.26	0.00	0.00	0.00	HO	0.02	0.24	1.20
Jul	0.01	0.00	0.23	3.17	0.00	0.09	0.00		0.00	3.73	3.25
Aug	0.00	0.00	HO	0.43	0.02	0.02	HO		0.00	0.04	0.06
Sep	0.00	0.00		0.12	HO	0.00			HO	0.61	2.00
Oct	0.00	0.00		0.85		0.62				0.36	1.13
Nov	0.02	0.00		2.30		0.00				0.13	0.80

Mean mobile *Caligus elongatus*

	Lough Swilly	Mulroy Bay	Donegal Bay	Clew Bay	Killary Harbour	Mannin Bay	Bertraghboy Bay	Kilkieran Bay	Greatman's Bay	Kenmare Bay	Bantry Bay
Dec / Jan	0.13	0.08	0.77	3.48	2.91	0.05	0.13	0.03	0.20	1.29	1.59
Feb	0.00	0.00	0.79	0.16	4.34	0.05	0.05	0.07	0.10	0.43	1.91
Mar	0.02	0.00	0.27	0.41	0.02	0.06	0.45	0.09	0.12	0.52	2.60
Apr	0.00	0.00	0.08	0.17	0.00	0.16	0.15	0.16	0.03	0.49	4.46
May	0.00	0.00	0.21	0.92	0.00	0.06	0.03	0.04	0.13	0.37	1.46
Jun	0.00	0.01	0.68	4.94	0.03	0.19	0.05	HO	0.02	0.51	2.20
Jul	0.01	0.00	0.26	7.91	0.02	0.46	0.07		0.12	8.06	5.27
Aug	0.00	0.00	HO	1.93	0.02	0.02	HO		0.02	0.04	0.11
Sep	0.00	0.00		0.36	HO	0.00			HO	1.36	3.60
Oct	0.00	0.00		1.51		0.87				0.90	1.97
Nov	0.02	0.00		4.92		0.03				0.27	2.10

HO = Harvested out

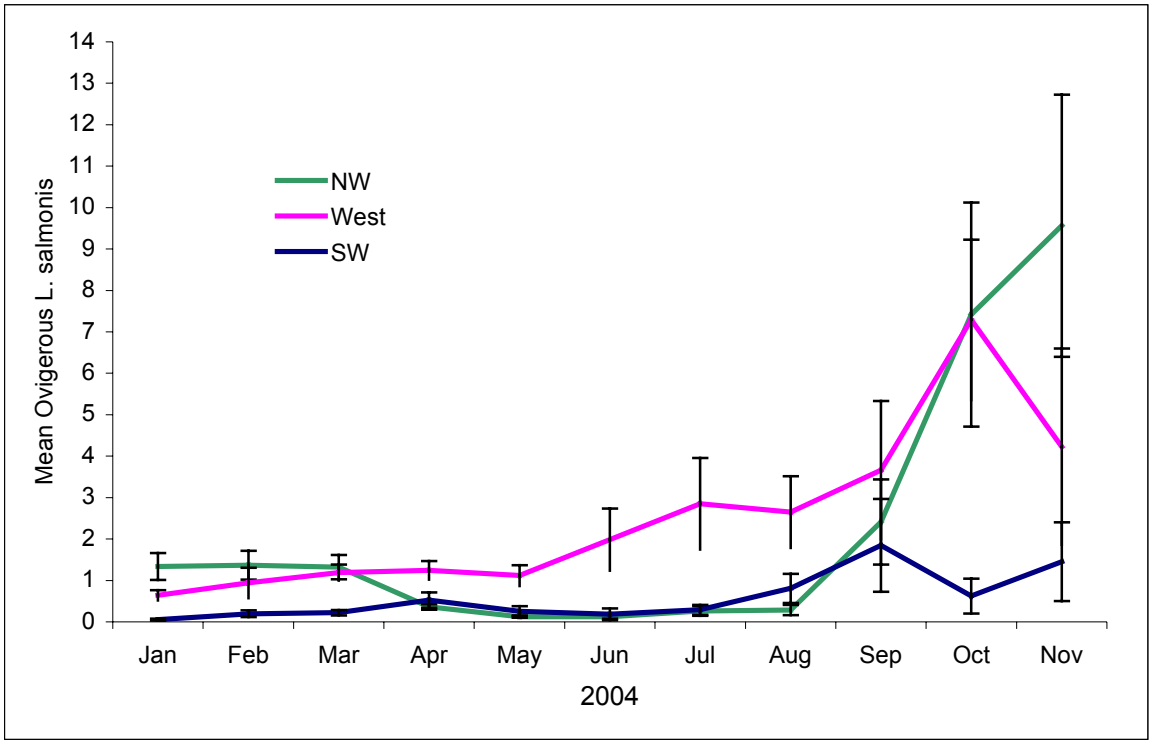

Figure 7. Mean (SE) ovigerous *L. salmonis* per month per region in 2004.

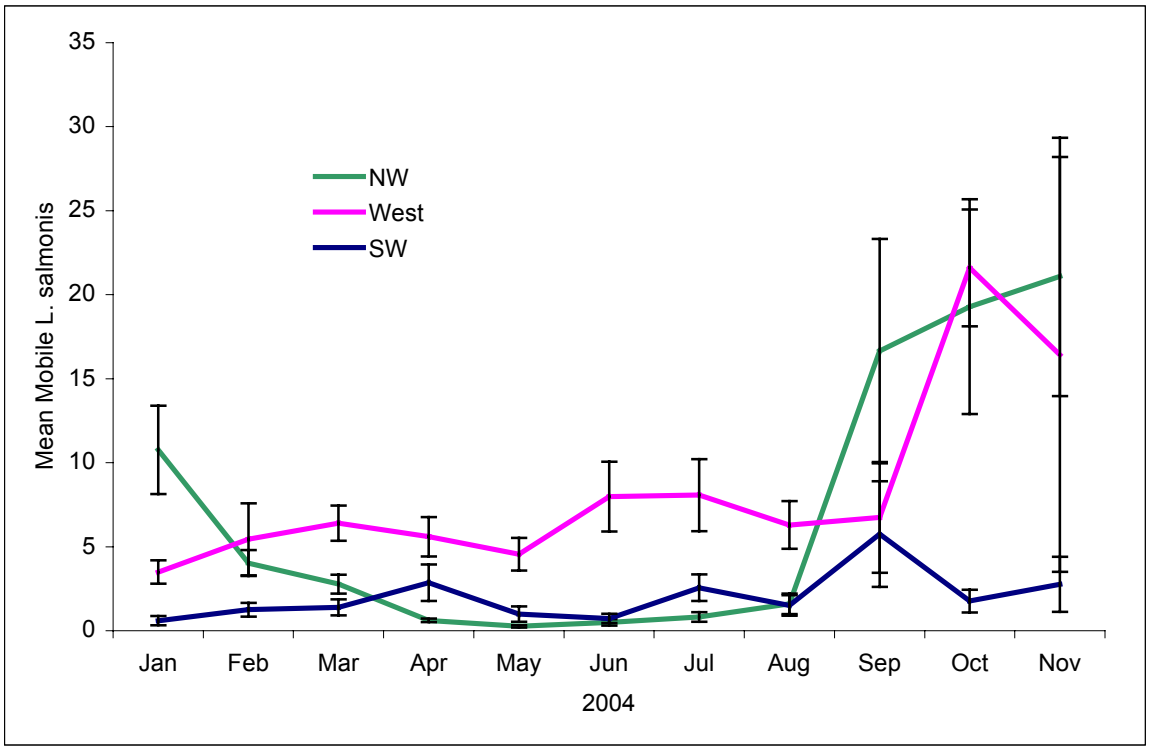

Figure 8. Mean (SE) mobile *L. salmonis* per month per region in 2004.

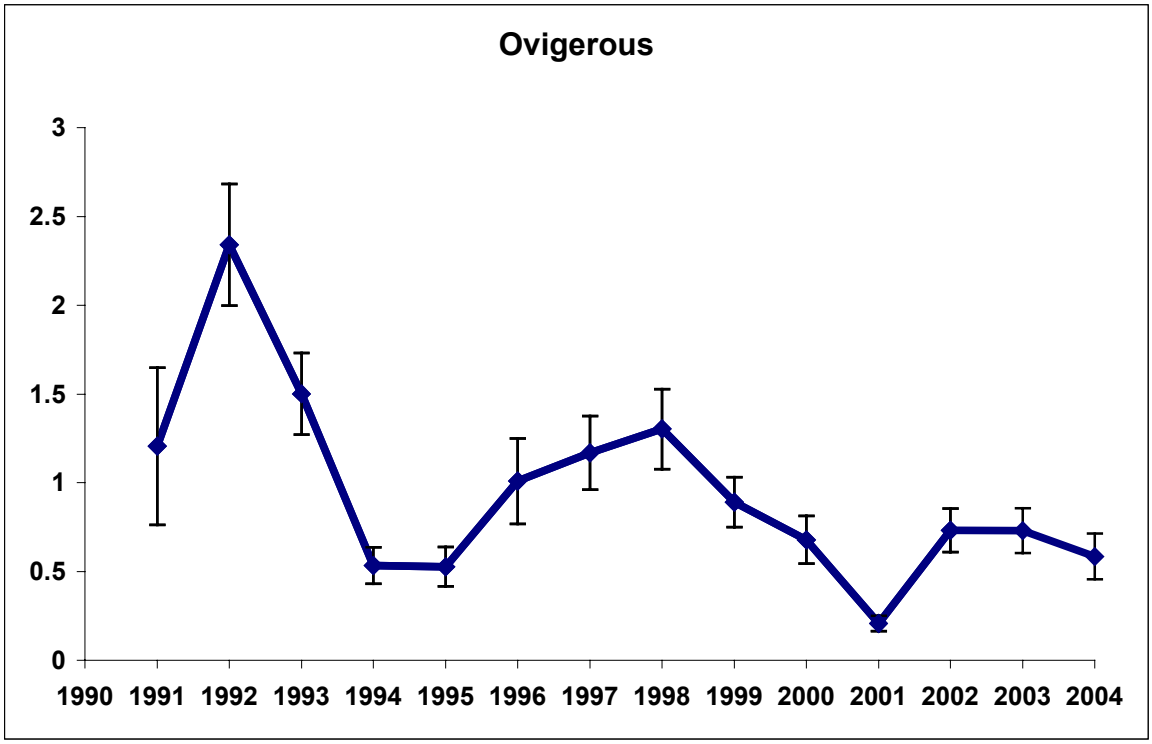

Figure 9. May mean (SE) ovigerous *L. salmonis* on one-sea-winter salmon.

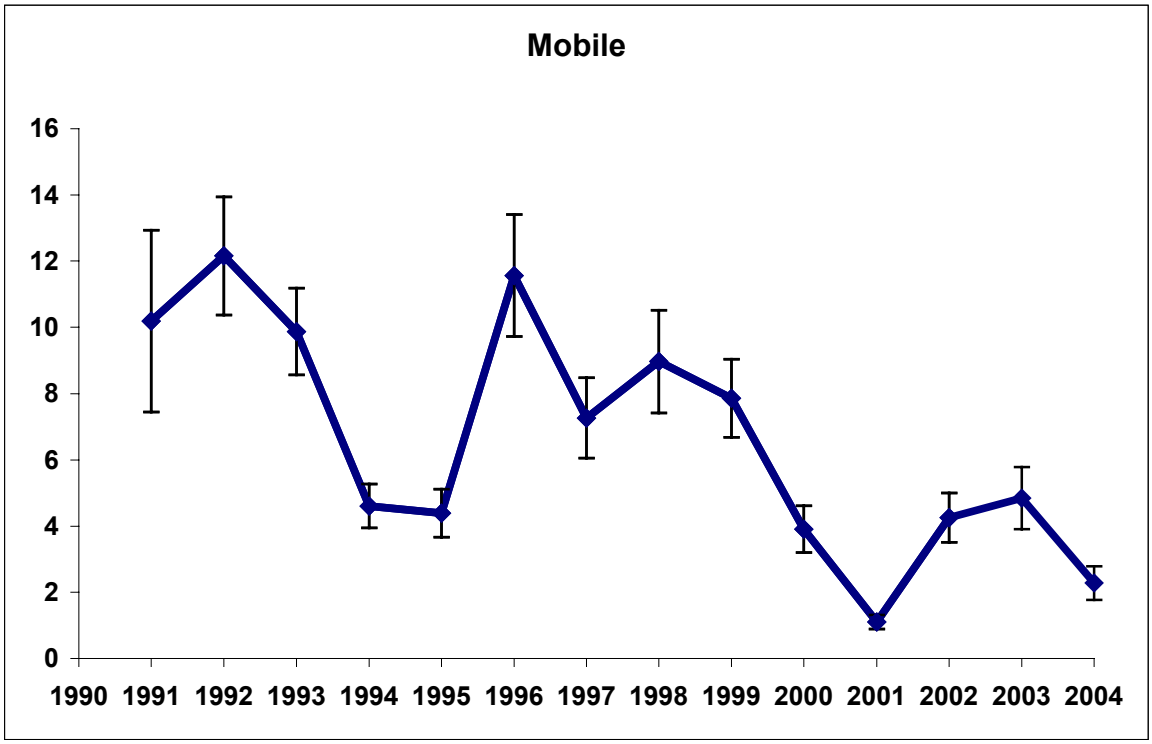

Figure 10. May mean (SE) mobile *L. salmonis* on one-sea-winter salmon.

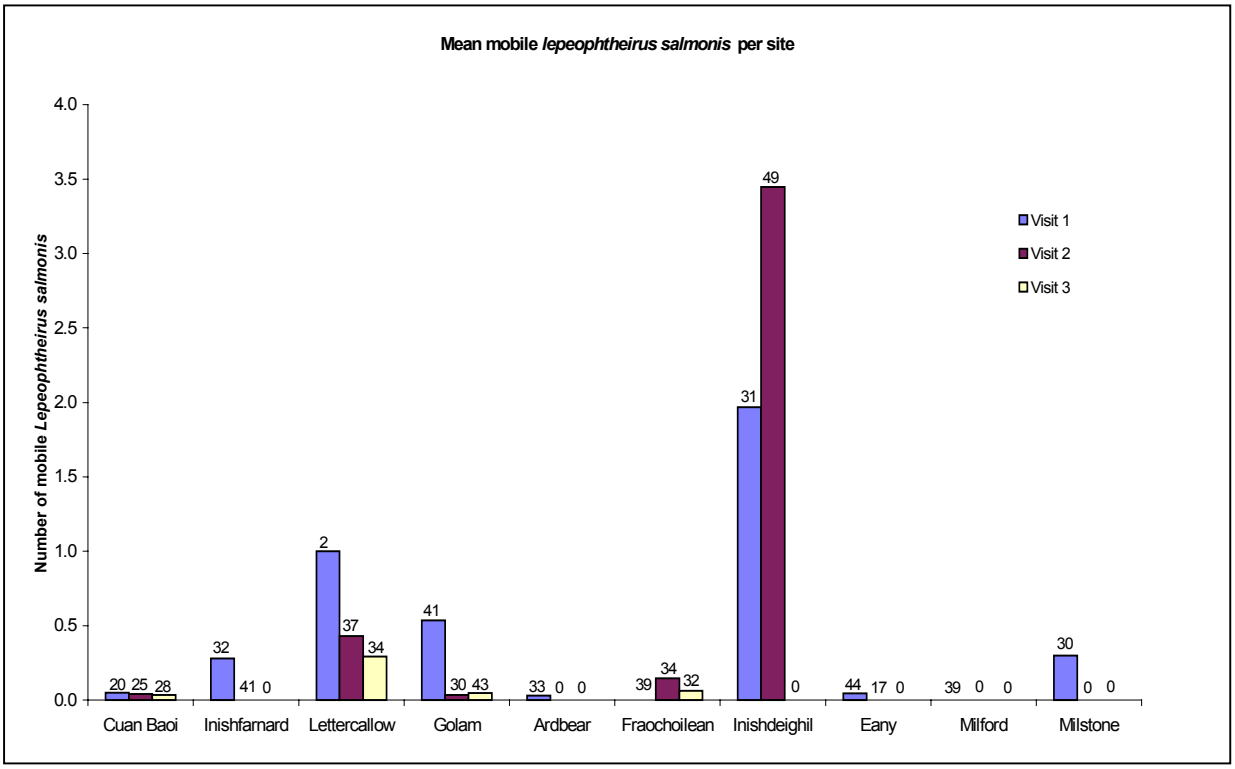

Figure 11. Mean mobile *L. salmonis* on 2004 smolts within first 3 months at sea (including sample number - n).

DISCUSSION

In 2004, of the 350 sea lice inspections carried out on salmonids, 78.6% of Atlantic salmon samples were below the treatment trigger levels outlined in DCMNR protocols and 95.5% of rainbow trout samples were below the levels. In the smolt stock 94.7% of inspections did not exceed the treatment trigger levels. One-sea-winter salmon had 66.7% of inspections and two-sea-winter salmon had 50% of inspections within the treatment trigger levels.

In the West region lice levels were in excess of treatment trigger levels on 49.3% of inspections of one-sea-winter salmon. In the Northwest and Southwest levels were exceeded on 30.8% and 12.8% of inspections, respectively.

During the critical spring period (March – May) 72.2% of inspections exceeded the treatment trigger in the West. In the Northwest 32.4% of inspections were above the levels and 17.4% in the Southwest.

The monthly trend of lice levels in one-sea-winter salmon show that the Southwest region achieved relatively good lice control throughout the year with a minor peak in September. Mean lice levels in the West region were relatively high for most of the year, with a high peak in October and November. The Northwest region started the year with elevated lice levels but achieved very low levels for the summer period. This changed towards the year end with high lice numbers being recorded in September, October and November.

It can be seen from the May mean *L. salmonis* plots that there was little appreciable difference in mean levels of ovigerous females recorded for 2004, 2003 and 2002. However a decrease in the May mean mobile value is apparent.

Looking at the whole year, lice numbers increased significantly in the latter few months of the year in the West and Northwest regions. Total lice numbers greater than 10 lice per fish were recorded on 19 inspections and numbers were greater than 20 lice per fish on 7 of these inspections. Lice are known to cause damage to fish at these levels (Wootten et al., 1982).

Complicating factors to sea lice management in 2004 may include both sea temperature and fish health. On average, mean monthly sea temperatures were 0.04^{o}C higher than 2003, 0.26^{o}C higher than 2002 and 1.09^{o}C higher than the 30 year mean. The month of February was 1.1^{o}C higher than in 2003 (worked from source data from Met Éireann). The life cycle of the sea louse is accelerated and reproductive output increased by an increase in sea temperatures (Hogans and Trudeau, 1989). Pancreas disease (PD) was reported in all three regions in 2004. Fish with PD are more susceptible to a greater parasitic burden and are more difficult to treat.

Sea lice levels on smolts going to sea

From Figure 10 we can see that the lice load at some sites increased very rapidly on the fish going to sea. There was a dramatic increase at Inishdeighil within the first two months of going to sea. The fish were in this site for 1.5 months prior to the first sampling. Golam and Lettercallow also showed signs of early infestation where the fish were sampled within one month of inputting to sea. It must be noted that the first sample in Lettercallow comprised of only 2 fish. These sites received an early treatment and numbers subsequently reduced.

Glossary of terms used:

Ovigerous lice:	An egg bearing adult female sea lice
Mobile lice:	All lice that are mobile – male and female (pre-adult and adult stages) sea lice that have developed beyond the attached larval stages
Standard (Std.) Cage:	The selected cage which is sampled at each inspection
Random (Ran.) Cage:	A cage which is selected by the inspector on the day of inspection
S1 Smolt:	This pertains to a stage in the life cycle of the salmon when it changes from being a freshwater fish to a seawater fish, a process known as smoltification. These fish are transported to the saltwater environment in the spring, which is approximately 15 months after they were hatched
S1/2 Smolt:	These fish are exposed to manipulated photoperiods to hasten the onset of smoltification. Hence an S1/2 smolt is ready to go to sea during the Autumn/Winter, approximately 11 months after hatching
Grower:	A fish which has been at sea for one complete year or longer

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APPENDIX 1. SEA LICE MONITORING ON SALMONID FARMS 2003

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
BANTRY BAY					
LASINGERS					
CUAN BAOI SEAFARMS LTD					
Atlantic salmon, 2002	19/02/04	2.20	12.30	1.90	2.90
			Harvested out		
Atlantic salmon, 2003	09/12/03	0.16	1.56	0.63	1.59
	19/02/04	0.44	2.53	0.83	1.91
	09/03/04	0.36	1.04	0.24	1.37
	23/03/04	0.25	2.25	1.47	3.83
	07/04/04	0.91	10.74	4.36	8.76
	23/04/04	0.42	0.85	0.07	0.15
	10/05/04	0.79	3.68	0.40	1.54
	21/05/04	0.10	0.87	0.65	1.37
	16/06/04	0.60	1.50	1.20	2.20
	21/07/04	0.62	4.96	3.25	5.27
	19/08/04	1.35	2.52	0.06	0.11
	23/09/04	1.30	5.10	2.00	3.60
	13/10/04	1.87	3.60	1.13	1.97
	10/11/04	2.40	4.40	0.80	2.10
Atlantic salmon, 2004	16/06/04	0.00	0.03	0.13	0.23
	21/07/04	0.00	0.54	0.73	1.54
	19/08/04	0.25	2.88	1.25	1.56
	23/09/04	0.75	2.19	0.31	0.65
	13/10/04	0.20	1.57	0.40	1.07
	10/11/04	0.23	1.23	1.00	2.67
JOHN POWER LTD					
Palmer's Point					
Rainbow trout, 2004	19/02/04	0.00	0.08	0.03	0.05
	09/03/04	0.00	0.12	0.00	0.03
	23/03/04	0.00	0.08	0.15	0.31
	07/04/04	0.02	0.17	0.06	0.46
	23/04/04	0.07	1.06	0.37	1.27
	10/05/04	0.50	1.70	1.05	1.80
	20/05/04	0.00	0.05	0.07	0.08
	16/06/04	0.07	0.33	0.43	0.59
			Harvested out		

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
KENMARE BAY					
SILVER KING SEAFOODS (BEARA ATLANTIC SALMON) LTD					
Deenish					
Atlantic salmon, 2003	10/12/03	0.02	0.03	1.30	2.54
	18/02/04	0.07	0.47	0.63	1.13
	24/03/04	0.55	4.12	0.43	1.12
	31/03/04	0.38	1.57	0.43	0.90
	08/04/04	1.59	3.31	0.35	0.67
	22/04/04	0.37	0.73	0.13	0.22
	11/05/04	0.30	0.49	0.14	0.20
	20/05/04	0.10	0.19	0.45	1.02
	15/06/04	0.13	0.43	0.53	1.03
	21/07/04	0.20	1.32	7.22	15.57
	18/08/04	0.27	0.48	0.04	0.04
	24/09/04	0.24	0.65	0.71	1.71
	12/10/04	0.35	1.04	0.70	1.80
	November	Missed due to adverse weather conditions			
Inishfarnard					
Atlantic salmon, 2004	15/06/04	0.00	0.07	0.07	0.12
	20/07/04	0.00	0.09	0.02	0.04
	18/08/04	0.02	0.30	0.10	0.10
	23/09/04	0.03	0.22	0.09	0.15
	12/10/04	0.06	0.39	0.19	0.68
	10/11/04	0.15	0.73	0.84	1.63
LASINGERS					
ST KILLIAN'S HARVEST LTD					
Kilmacillogue					
Atlantic salmon, 2003	09/12/03	0.07	0.99	0.22	0.40
S 1/2	18/02/04	0.10	0.82	0.12	0.23
	10/03/04	0.08	0.34	0.02	0.24
	23/03/04	0.02	0.41	0.03	0.08
	08/04/04	0.07	0.13	0.07	0.35
	22/04/04	0.07	4.93	0.07	0.50
	11/05/04	0.27	0.43	0.03	0.10
			Harvested out		
Doon Point					
Atlantic salmon, 2003	09/12/03	0.00	0.00	0.28	0.55
	18/02/04	0.03	0.37	0.13	0.13
	23/03/04	0.00	0.13	0.30	0.50
	31/03/04	0.00	0.00	0.14	0.45
	07/04/04	0.03	0.03	0.27	0.83
	22/04/04	0.00	0.63	0.23	0.60
	11/05/04	0.00	0.07	0.00	0.03
	20/05/04	0.00	0.03	0.03	0.03
	15/06/04	0.00	0.50	0.10	0.25
	20/07/04	0.06	1.41	0.25	0.54

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
August	Not sampled due to fish health problems				
	23/09/04	4.00	11.50	0.50	1.00
	12/10/04	0.14	1.22	0.19	0.45
	10/11/04	0.50	1.13	0.13	0.27

GREATMAN'S BAY

TAIRGEOIRI BIAMARA ATLANTACH TEO

Carraroe

Atlantic salmon, 2003	16/01/04	0.67	2.29	0.09	0.20
	12/02/04	0.65	1.94	0.04	0.10
	13/03/04	0.61	2.14	0.00	0.06
	26/03/04	0.56	2.91	0.02	0.19
	20/04/04	0.73	1.98	0.00	0.02
	29/04/04	1.10	3.04	0.02	0.04
	14/05/04	1.10	2.44	0.05	0.19
	28/05/04	1.05	2.95	0.03	0.08
	21/06/04	1.33	13.98	0.02	0.02
	26/07/04	8.36	13.92	0.00	0.12
	30/08/04	6.11	11.61	0.00	0.02
			Harvested out		

MUIRACHMHAINNI TEO

Cuigeal

Atlantic salmon, 2004	12/05/04	0.00	0.16	0.02	0.02
S1/2	20/05/04	0.00	0.15	0.00	0.02
	18/06/04	0.00	1.20	0.02	0.20
	14/07/04	0.43	5.13	0.07	0.25
	05/08/04	1.35	5.88	0.00	0.64
	09/09/04	0.00	1.31	0.00	0.22
			Transferred to Daonish		

KILKIERAN BAY

MUIRACHMHAINNI TEO

Daonish

Atlantic salmon, 2003	22/01/04	0.40	1.44	0.00	0.03
S1/2	25/02/04	1.23	4.97	0.02	0.10
	12/03/04	1.46	10.94	0.06	0.19
	30/03/04	0.91	1.76	0.00	0.00
	19/04/04	0.33	1.98	0.00	0.00
	27/04/04	0.58	3.38	0.08	0.32
	17/05/04	1.50	7.87	0.02	0.04
			Harvested out		
Atlantic salmon, 2004	28/10/04	0.50	7.95	0.00	0.00
S1/2	29/11/04	0.23	6.13	0.04	0.06

		Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
			F + eggs	Total	F + eggs	Total
Casheen						
	Atlantic salmon, 2003	22/01/04	0.62	3.14	0.00	0.03
	S1/2	25/02/04	0.77	3.33	0.00	0.00
		12/03/04	1.77	14.45	0.00	0.06
		March		Harvested out		
Golam						
	Atlantic salmon, 2004	01/03/04	0.00	0.06	0.00	0.03
	S1/2	19/03/04	0.00	0.45	0.00	0.05
		07/04/04	0.00	0.84	0.05	0.22
		22/04/04	0.00	0.23	0.00	0.02
				Transferred to Red Flag and Cuigeal		
Red Flag						
	Atlantic salmon, 2004	22/04/04	0.02	0.42	0.05	0.08
	S1/2	12/05/04	0.05	1.32	0.03	0.12
		20/05/04	0.04	1.24	0.08	0.21
		18/06/04	0.70	6.87	0.09	0.29
		14/07/04	0.38	2.28	0.12	0.35
		05/08/04	1.27	5.02	0.03	0.07
		09/09/04	0.35	1.82	0.00	0.02
				Transferred to Daonish		
MUIR GHEAL TEO						
Lettercallow						
	Atlantic salmon, 2004	01/03/04	0.00	0.51	0.07	0.10
	S1/2	19/03/04	0.00	0.76	0.02	0.02
		07/04/04	0.00	1.14	0.00	0.02
		22/04/04	0.00	0.33	0.00	0.00
		12/05/04	0.00	0.34	0.00	0.00
		20/05/04	0.00	0.16	0.00	0.00
				Transferred to Oilean Iarthach		
Oilean Iarthach						
	Atlantic salmon, 2004	20/05/04	0.00	0.43	0.02	0.04
	S1/2	21/06/04	3.55	15.93	0.39	1.12
		26/07/04	0.39	0.54	0.00	0.02
		23/08/04	1.86	3.71	0.00	0.00
		24/09/04	0.47	5.52	0.00	0.00
				Transferred to Cnoc		
Cnoc						
	Atlantic salmon, 2004	12/10/04	0.92	2.85	0.00	0.00
	S1/2	18/11/04	2.95	36.93	0.00	0.02

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
EISC UI FLATHARTHA TEO					
Ardmore					
Rainbow Trout, 2004	29/10/04	0.04	2.00	0.15	0.30
	23/11/04	0.45	7.05	0.42	0.72
BERTRAGHBOY BAY					
COMHLACHT BRADAIN CONNAMARRA TEO					
Salt Point					
Atlantic salmon, 2003	16/01/04	0.78	2.34	0.08	0.15
S1/2	11/02/04	0.35	2.72	0.07	0.08
	19/03/04	1.29	7.97	0.12	0.27
	31/03/04	1.93	7.94	0.25	0.50
	14/04/04	1.65	6.28	0.00	0.03
	23/04/04	1.39	5.25	0.00	0.05
	06/05/04	1.65	6.74	0.02	0.05
	28/05/04	3.04	6.44	0.02	0.02
	15/06/04	1.42	11.32	0.00	0.03
			Harvested out		
Atlantic salmon, 2003	16/01/04	0.40	1.84	0.03	0.12
	18/02/04	0.53	4.20	0.00	0.00
	19/03/04	1.00	14.77	0.09	0.68
	31/03/04	1.90	18.63	0.20	0.50
	14/04/04	3.56	19.82	0.32	0.60
	23/04/04	2.80	13.67	0.00	0.17
	06/05/04	4.00	14.94	0.00	0.06
	28/05/04	1.26	3.52	0.00	0.00
	15/06/04	2.00	5.77	0.00	0.07
	16/07/04	3.87	5.87	0.00	0.07
			Harvested out		
MANNIN BAY					
MANNIN BAY SALMON CO LTD					
Corhounagh					
Atlantic salmon, 2003	25/05/04	0.16	12.16	0.00	0.12
	11/06/04	5.82	14.61	0.00	0.19
	15/07/04	1.69	15.16	0.09	0.46
	06/08/04	1.91	4.61	0.02	0.02
	08/09/04	1.55	2.57	0.00	0.00
	08/10/04	10.25	25.87	0.62	0.87
	26/11/04	1.30	3.23	0.00	0.03

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Hawk's Nest					
Atlantic salmon, 2003	15/01/04	0.25	1.36	0.03	0.05
	12/02/04	0.65	2.02	0.00	0.05
	03/03/04	0.22	2.44	0.00	0.02
	19/03/04	0.59	4.04	0.03	0.11
	01/04/04	1.88	10.93	0.05	0.09
	26/04/04	3.76	18.20	0.12	0.23
	07/05/04	0.12	0.15	0.00	0.00
			Transferred to Corhounagh		
Atlantic salmon, 2004	15/07/04	0.00	0.12	0.00	0.01
	06/08/04	0.00	0.14	0.02	0.03
	08/09/04	0.05	0.08	0.04	0.05
	08/10/04	0.09	1.32	0.12	0.13
	26/11/04	1.55	10.66	0.08	0.12
Ardbear					
Atlantic salmon, 2004	11/06/04	0.00	0.20	0.00	0.03
BALLINAKILL BAY					
BIFAND LTD					
Fraochoilean					
Atlantic salmon, 2004	03/03/04	0.00	0.03	0.00	0.00
S1/2	19/03/04	0.00	0.05	0.00	0.00
	01/04/04	0.00	0.03	0.00	0.00
	26/04/04	0.00	2.18	0.00	0.04
	07/05/04	0.03	2.01	0.00	0.04
	25/05/04	0.29	1.35	0.07	0.15
	11/06/04	0.09	0.97	0.04	0.11
	15/07/04	0.00	0.26	0.07	0.12
	06/08/04	0.00	0.20	0.05	0.08
	08/09/04	0.20	1.13	0.09	0.09
	08/10/04	0.50	9.05	0.18	0.40
	26/11/04	1.38	16.61	0.46	0.81
KILLARY HARBOUR					
CELTIC ATLANTIC SALMON (KILLARY) LTD					
Rosroe					
Atlantic salmon, 2003	13/01/04	0.33	8.33	0.47	2.91
	18/02/04	2.92	21.86	2.07	4.34
	19/03/04	3.25	13.24	0.02	0.04
	29/03/04	1.84	6.15	0.00	0.00
	15/04/04	0.51	1.80	0.00	0.00
	30/04/04	0.46	0.86	0.00	0.00
	14/05/04	0.71	0.95	0.00	0.00
	27/05/04	0.08	0.19	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
	15/06/04	0.31	0.50	0.00	0.03
	16/07/04	0.14	1.63	0.00	0.02
	20/08/04	1.22	5.13	0.02	0.02
			Harvested out		
Inishdeighil					
Atlantic salmon, 2004	19/05/04	0.03	2.66	1.00	2.59
	27/05/04	0.00	0.38	0.01	0.05
	15/06/04	0.00	0.12	0.02	0.04
	16/07/04	0.00	0.90	0.10	0.28
	20/08/04	0.02	0.34	0.00	0.00
	30/09/04	0.25	1.81	0.00	0.02
	29/10/04	1.60	13.05	0.00	0.00
	17/11/04	1.81	6.63	0.00	0.00

CLEW BAY

CLARE ISLAND SEAFARMS LTD

Portlea

Atlantic salmon, 2003	11/12/03	1.83	8.26	1.98	3.48
	12/02/04	0.15	0.85	0.11	0.16
	05/03/04	0.66	1.63	0.20	0.41
	24/03/04	0.48	1.32	0.24	0.42
	08/04/04	0.43	1.50	0.05	0.33
	22/04/04	0.17	0.82	0.00	0.02
	13/05/04	0.47	2.97	0.33	0.43
	26/05/04	0.60	1.79	0.36	1.17
	18/06/04	0.74	2.12	1.26	4.94
	06/07/04	0.71	2.68	3.17	7.91
	10/08/04	1.37	3.83	0.43	1.93
	24/09/04	5.78	10.92	0.12	0.36
	01/11/04	4.34	17.34	0.85	1.51
			Transferred to Seastream Inner		

Clare Island smolt site

Atlantic salmon, 2004	June and July visits missed due to fish health problems				
	10/08/04	0.17	1.33	1.23	3.22
	24/09/04	0.27	1.23	0.06	0.11
	01/11/04	0.44	5.30	0.22	0.62
	18/11/04	0.45	5.92	0.60	1.90

Seastream Outer

Atlantic salmon, 2002	11/12/03	2.07	3.50	0.00	0.03
	12/02/04	0.00	0.07	0.03	0.03
	05/03/04	0.00	5.55	0.13	1.84
	13/04/04	0.00	0.03	0.03	0.03
			Transferred to Seastream Inner		

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
CLARE ISLAND SEAFARMS LTD					
Seastream Inner					
Atlantic salmon, 2002	11/12/03	2.30	3.27	0.30	0.73
	12/02/04	1.17	2.77	0.07	0.30
	05/03/04	1.07	2.17	0.03	0.13
	24/03/04	0.40	0.83	0.17	0.37
	28/04/04	0.07	0.33	0.03	0.13
			Harvested out		
Atlantic salmon, 2003	18/11/04	5.70	23.03	2.30	4.92
SEASTREAM LTD					
Seastream Inner					
Rainbow Trout, 2003	11/12/03	0.15	0.62	0.46	1.31
			Harvested out		
DONEGAL BAY					
OCEAN FARM LTD					
McSwyne's					
Atlantic salmon, 2003	21/01/04	0.79	5.05	0.07	0.15
	10/02/04	1.86	5.95	0.07	0.12
	04/03/04	2.29	5.41	0.02	0.05
			Harvested out		
CREEVIN SALMON FARM LTD					
Inver Bay					
Atlantic salmon, 2003	21/01/04	0.03	1.33	0.57	1.40
	10/02/04	0.10	2.60	0.80	1.70
	04/03/04	0.17	0.43	0.00	0.07
	25/03/04	0.07	0.53	0.00	0.03
	14/04/04	0.00	0.17	0.00	0.00
	27/04/04	0.09	0.21	0.06	0.12
	12/05/04	0.03	0.23	0.03	0.07
			Harvested out		
EANY FISH PRODUCTS LTD					
Inver Bay					
Rainbow trout, 2004	21/01/04	0.17	7.17	1.90	3.10
	10/02/04	0.00	1.41	0.41	0.90
	04/03/04	0.12	1.15	0.80	1.71
	25/03/04	0.00	0.00	0.00	0.00
	14/04/04	0.00	0.03	0.00	0.00
	27/04/04	0.00	0.03	0.00	0.03
	12/05/04	0.00	0.00	0.10	0.23

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
	25/05/04	0.00	0.30	0.00	0.13
	09/06/04	0.20	0.56	0.16	0.16
	07/07/04	0.10	0.23	0.00	0.00
	11/08/04	0.33	2.07	0.27	0.33
			Harvested out		
Atlantic salmon, 2003	21/01/04	0.03	1.00	0.80	1.37
	10/02/04	0.03	2.39	0.68	1.23
	04/03/04	0.35	2.52	0.57	1.30
	25/03/04	0.97	3.03	0.03	0.13
	14/04/04	0.20	0.80	0.00	0.10
	27/04/04	0.65	1.55	0.03	0.10
	12/05/04	0.23	1.00	0.09	0.45
	25/05/04	0.17	0.83	0.00	0.10
	09/06/04	0.36	1.00	0.36	0.68
	07/07/04	0.74	1.73	0.23	0.26
			Harvested out		
Atlantic salmon, 2004	09/06/04	0.00	0.00	0.00	0.05
	07/07/04	0.00	0.09	0.00	0.00
	11/08/04	0.01	0.31	0.02	0.02
	23/09/04	0.00	0.12	0.00	0.00
	20/10/04	0.09	0.56	0.00	0.00
	11/11/04	0.13	0.52	0.00	0.02

MULROY BAY

MARINE HARVEST

Cranford A

Atlantic salmon, 2003	09/12/03	2.52	14.77	0.00	0.03
S1/2	11/02/04	1.39	3.69	0.00	0.00
	03/03/04	1.23	2.62	0.00	0.00
	24/03/04	0.45	0.75	0.00	0.00
	07/04/04	0.50	0.75	0.00	0.00
	23/04/04	0.35	0.52	0.00	0.00
			Harvested out		
Atlantic salmon, 2004	24/05/04	0.00	0.04	0.00	0.02
S1/2	15/06/04	0.00	0.46	0.00	0.00
	13/07/04	0.00	0.03	0.00	0.00
	10/08/04	0.15	1.79	0.00	0.02
	08/09/04	1.10	3.54	0.00	0.00
	20/10/04	2.90	66.52	0.00	0.00
	17/11/04	12.78	63.41	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
Cranford C					
Atlantic salmon, 2004	11/02/04	0.06	2.98	0.00	0.26
S1/2	03/03/04	0.03	0.45	0.00	0.00
	24/03/04	0.00	0.05	0.00	0.00
	07/04/04	0.00	0.02	0.00	0.02
	23/04/04	0.00	0.02	0.00	0.00
	12/05/04	0.00	0.00	0.00	0.00
			Transferred to Cranford A		
Moross					
Atlantic salmon, 2003	09/12/03	2.47	24.16	0.00	0.09
S1/2	10/02/04	1.75	4.75	0.00	0.00
	03/03/04	1.91	3.90	0.00	0.00
	24/03/04	2.37	3.47	0.00	0.00
	07/04/04	0.78	1.28	0.00	0.00
	23/04/04	0.43	0.54	0.00	0.00
	12/05/04	0.42	0.52	0.00	0.00
	24/05/04	0.17	0.32	0.00	0.00
	15/06/04	0.16	0.44	0.00	0.00
			Harvested out		
Atlantic salmon, 2004	10/08/04	0.22	4.49	0.00	0.00
S1/2	08/09/04	1.30	5.46	0.00	0.00
	20/10/04	1.99	20.85	0.00	0.00
	17/11/04	5.53	28.33	0.00	0.00
Moross I					
Atlantic salmon, 2004	10/02/04	0.00	0.40	0.00	0.00
S1/2	03/03/04	0.00	0.02	0.00	0.00
	24/03/04	0.00	0.00	0.00	0.00
	07/04/04	0.00	0.02	0.00	0.00
	23/04/04	0.00	0.00	0.00	0.00
	12/05/04	0.02	0.04	0.00	0.00
	24/05/04	0.00	0.00	0.00	0.00
	15/06/04	0.00	0.39	0.00	0.00
	13/07/04	0.03	0.13	0.00	0.00
			Transferred to Moross		
Millstone					
Atlantic salmon, 2003	09/12/03	0.34	4.41	0.00	0.15
	10/02/04	0.68	2.00	0.00	0.02
	04/03/04	0.51	1.33	0.00	0.00
	25/03/04	0.15	0.30	0.02	0.02
	08/04/04	0.22	0.32	0.00	0.00
	22/04/04	0.03	0.07	0.00	0.00
	12/05/04	0.03	0.03	0.00	0.00
	24/05/04	0.02	0.10	0.00	0.00

		Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
			F + eggs	Total	F + eggs	Total
		15/06/04	0.20	1.28	0.00	0.02
		13/07/04	0.35	1.21	0.00	0.00
		10/08/04	0.32	2.88	0.00	0.00
		08/09/04	4.19	28.03	0.00	0.00
		19/10/04	11.47	28.22	0.00	0.00
		18/11/04	13.45	29.24	0.00	0.00
	Atlantic salmon, 2004	24/05/04	0.00	0.15	0.00	0.04
		15/06/04	0.00	0.67	0.15	0.23
		13/07/04	0.00	0.02	0.00	0.00
		10/08/04	0.17	2.27	0.00	0.00
		08/09/04	2.08	14.62	0.00	0.00
		19/10/04	1.76	5.66	0.00	0.00
		18/11/04	4.13	19.81	0.00	0.00
Glinsk						
	Atlantic salmon, 2004	24/03/04	0.00	0.00	0.00	0.00
		07/04/04	0.00	0.00	0.00	0.00
		22/04/04	0.00	0.02	0.00	0.00
		12/05/04	0.00	0.06	0.02	0.06
		24/05/04	0.00	0.05	0.00	0.05
		15/06/04	0.00	0.44	0.00	0.05
		13/07/04	0.00	0.02	0.00	0.00
		10/08/04	0.00	0.69	0.00	0.00
		08/09/04	1.08	6.97	0.00	0.04
		19/10/04	1.28	3.65	0.00	0.00
		18/11/04	1.10	14.69	0.00	0.00
Millford						
	Atlantic salmon, 2003	10/12/03	0.37	3.21	0.00	0.06
		10/02/04	0.18	0.73	0.00	0.00
			Transferred to Milstone and Lough Swilly			
	Atlantic salmon, 2004	13/05/04	0.00	0.03	0.00	0.00
		25/05/04	0.00	0.00	0.00	0.00
		16/06/04	0.00	0.00	0.00	0.00
		14/07/04	0.00	0.00	0.00	0.00
		11/08/04	0.00	0.00	0.00	0.00
		09/09/04	0.02	0.19	0.00	0.00
		20/10/04	0.08	0.86	0.00	0.00
		17/11/04	0.02	0.49	0.00	0.00

	Date	*Lepeophtheirus salmonis*		*Caligus elongatus*	
		F + eggs	Total	F + eggs	Total
LOUGH SWILLY					
MARINE HARVEST					
Atlantic salmon, 2002	10/12/03	5.03	16.78	0.04	0.10
	11/02/04	2.24	4.14	0.03	0.07
			Harvested Out		
Atlantic salmon, 2003	10/12/03	2.83	22.61	0.05	0.13
S1/2	11/02/04	3.65	8.57	0.00	0.00
	04/03/04	2.13	4.71	0.02	0.03
	25/03/04	4.17	6.80	0.00	0.00
	08/04/04	0.88	1.45	0.00	0.00
	22/04/04	0.50	0.65	0.00	0.00
	13/05/04	0.10	0.14	0.00	0.00
	25/05/04	0.17	0.22	0.00	0.00
	16/06/04	0.04	0.05	0.00	0.00
	14/07/04	0.13	0.43	0.03	0.03
	11/08/04	0.70	1.80	0.00	0.00
			Harvested Out		
Atlantic salmon, 2003	08/04/04	0.09	0.25	0.00	0.00
	22/04/04	0.08	0.16	0.00	0.00
	13/05/04	0.04	0.06	0.00	0.00
	25/05/04	0.06	0.06	0.00	0.02
	16/06/04	0.00	0.00	0.00	0.00
	14/07/04	0.00	0.20	0.00	0.00
	11/08/04	0.05	0.21	0.00	0.00
	09/09/04	0.64	5.27	0.00	0.00
	19/10/04	3.37	10.37	0.00	0.00
	18/11/04	5.68	12.94	0.02	0.02
Atlantic salmon, 2004	18/11/04	0.87	11.43	0.00	0.00